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REMARKS

Claims 1-12 are pending in the application. Claims 1-9 are rejected. Claims 4 and 8 are objected to. Claims 4 and 8 and portions of the specification are amended herein to more clearly distinguish the invention. Claims 10-12 have been added by this amendment.

1. Objection to the Specification and Claims

Portions of the specification and claims 4 and 8 are objected to as containing a common typographical error. Applicant has amended the specification and claims in order to correct this error. Claim 8 was also amended to show proper dependency. Applicant submits that the amendments herein obviate the objections.

Applicant respectfully requests reconsideration of the specification and claims as amended and withdrawal of the rejections and objections thereto.

2. Rejection Under 35 U.S.C. § 102

THE EXAMINER STATES:

> "4. Claims 1 and 5 are rejected under 35 U.S.C. § 102(b) as being anticipated by McClain et al. (U.S. Patent 4,370,098).
>
> 5. As per claim 1, McClain et al. disclose a process for measuring and monitoring motor systems (i.e. abstract, column 1, lines 50-63) said process comprising: providing a motor system having at least one component selected from a stator and an armature (i.e. Fig. 1, #5; column 1, lines 25-33), said at least one component connected to at least one electrical wire (i.e. Fig. 1, column 14, lines 61-68); incorporating at least one means for data measurement with said at least one electrical wire (i.e. Fig. 1, #s 16-18); collecting data with said at least one means for data measurement (i.e. column 4, lines 25-38); and transferring said collected data to a data collection station (i.e. Fig. 1, #12).

The McClain patent does not teach monitoring internal motor conditions with sensors. Applicant's invention teaches placing optical fiber and sensors based on photonic methods to monitor internal electrical motor parameters. This placement of sensors inside the electrical motor is not taught nor made obvious by McClain. Firstly, it is only with photonic measurement methods that one can safely and practically place measurement devices inside electrical motors. This is due to the less-than-obvious fact that photonic devices are inert to electro-magnetic phenomena of which there are considerable amounts in an electrical motor.

> 6. As per claim 5, McClain et al. disclose a process for measuring and monitoring motor systems (i.e. abstract, column 1, lines 50-63), said process comprising: providing a motor

system having at least one motor component selected from a stator and an armature (i.e. Fig. 1, #5; column 1, lines 25-33), said at least one component connected to at least one electrical wire (i.e. Fig. 1, #6, column 14, lines 61-68); providing at least one means for data measurement (i.e. Fig. 1, #s 16-18); connecting said at least one means for data measurement with said at least one motor component (i.e. Fig. 1); collecting data with said at least one means for data measurement (i.e. column 4, lines 25-38); and transferring said collected data to a data collection station (i.e. Fig. 1, #12)."

Firstly, McClain asserts that motor temperature during online conditions can be calculated by a series of equations which he discusses. What McClain does not understand is the actual dynamics of producing fluids in an oil and gas well and their effect on the internal motor temperature. For example, the heat in the motor can rise to levels that will cause insulation failure of the motor wire in the stator depending on the dynamic flow conditions in the well. These flow conditions are unique in each well, and change with time and operational conditions. Hence, the teachings of the McClain patent cannot be practiced in a real oil and gas well without the use of Applicant's invention that teaches the real time monitoring of internal motor temperatures under continually changing dynamic conditions. For example, the method of optical time domain reflectometry can determine the internal motor temperatures of the motor stator at thousands of points along the optical fiber disposed inside the motor and allow for the correct motor temperature inside the motor to be known at the surface.

The optical fiber monitoring devices, as well as micro-machine devices, are very small and hence allow for many more such sensors to be placed inside the motors, without taking up the limited space that one has in a traditional oil and gas well casing. The key here, again, is that Applicant's invention teaches the placement of a plurality of sensors inside an electrical machine, in this case, the stator. The designers of submersible electrical motors work to great degrees of difficulty to place as much motor wire in these long electrical motors to increase electrical power output and efficiency. Applicant teaches a novel new way of gaining copious internal motor data without sacrificing the limited space that motor designers need to improve the efficiency and power output in the given well casing geometry. No place in the patent is it discussed where the inventor understands the need to place small sensors inside motors. Furthermore, conventional electrical wire transmission of conventional thermocouple data, or vibration data, etc., require electrical wires to transmit the data from inside the motor. This is not at all desirable as the wires take up space in the stator slots, and these additional electrical

wires can fail causing short circuits inside the motor. On the other hand, Applicant teaches the use of optical fibbers which are made of non-conducting electrical material such as silicon dioxide.

3. **Rejection Under 35 U.S.C. § 103(a)**

THE EXAMINER STATES:

> "8. **Claims 2-4 and 6-9** are rejected under 35 U.S.C. § 103(a) as being unpatentable over McClain et al. (U.S. Patent 4,370,098).
>
> 9. As per **claims 2-4**, McClain et al. do not explicitly disclose a process according to claim one, wherein a) means for measuring data is wrapped around said electrical wire b) means for measuring data is encapsulated and attached to said electrical wire by covering or coating the electrical wire and the means for measuring data with an insulating material, and c) means for measuring data is selected from optic fibers, sensors, [micro-machines] and combinations thereof. However, McClain et al. teach a process for measuring and monitoring motor systems, in particular motor systems operating in remotely inaccessible locations (i.e. abstract, column 1, lines 50-63). It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the use of fiber optic (cables, wave guides, etc., or other functionally equivalent means) since it was known in the art that (i.e.) fiber optic (cables) could be used to transfer information (i.e. wavelength dependent) from relatively inaccessible / hazardous locations. Cables (optical, electrical, etc. would require protective coating/insulation depending on environmental conditions and/or transmission requirements. Accordingly, such modifications would have been obvious to one having ordinary skill in the art since the claimed limitations do not alter the scope (or spirit) of the disclosed invention (McClain et al.).

However, McClain fails to understand that the internal monitoring of the motor system is critical since the downhole fluids passing by the electrical motor carry heat away from the motor depending upon their specific heat, their flow rates, and the geothermal temperatures from which they are produced, all of which cannot be calculated, but must be measured in-situ.

Clearly, McClain does not understand the art of producing fluids in an oil and gas well nor the operational issues related to the day-to-day equipment aging. His references to the use of manufacturers' curves and theoretical slip of motors to obtain internal motor temperature in an oil and gas well is not realistic. Moreover, his invention teaches away from

Applicant's invention where he argues that he could obtain, at surface, the necessary data to understand the downhole conditions of the motor. Again, this is absurd as he does not discuss continually monitoring the heat capacity of the fluid flowing by the motor which may cool the motor, nor does he discuss any method to continually monitor the properties of gas, water and oil that flow periodically, which is what Applicant's invention teaches. Those who are familiar with the art of oil and gas wells know that these fluids surge and slug and are not continuous, nor is there any method to predict how they are changing. Perhaps the Examiner, when she uses the term "skilled in the art" assumes one who is skilled in the art of motor manufacturing. In this case, we are now not talking about McClain's patent as he is interested in monitoring a submersible pump and motor system. Applicant is teaching the monitoring of the internal parameters of an electrical motor. Applicant is not pursuing the monitoring of a pump and motor well system; more specifically, Applicant is pursuing the monitoring of the internal parameters of an electrical motor using optical fibers and micro-machines.

> 10. As per **claims 6-9** McClain et al. do not explicitly disclose the arrangement of measuring means contained within a tube or wherein the tube is wound in a motor stator with electrical wire. Additionally, McClain et al. do not explicitly disclose the composition of measuring means selected from optic fibers, sensors, [micro-machines] and combinations thereof. However, McClain et al. teach a process for measuring and monitoring motor systems, in particular motor systems operating in remotely inaccessible locations (i.e. abstract, column 1, lines 50-63). It would have been obvious to one having ordinary skill in the art, at the time the invention was made to incorporate the use of fiber optic (cables, wave guides, etc., or other functionally equivalent means) since it was known in the art that (i.e. fiber optic (cables) could be used to transfer information (i.e. wavelength dependent) from relatively inaccessible / hazardous locations. Accordingly, cables (optical, electrical, etc.) would require protective coating / insulation depending on environmental conditions, or transmission requirements."

McClain does not do this by actually placing optical fiber and micro-machines inside the electrical motor where one finds the actual temperatures of the motor winding. By using small monitoring sensors, like optical fiber sensors, Applicant teaches that one can see the temperatures along the great lengths of these submersible motors, which is sometimes a motor of 100 feet or more in length. The shear number of conventional electrical sensors, say of the thermocouple or resistive temperature devices, would require thousands of transmission fibers

to be run down the well to the depth of the motor. Whereas the optical fiber can monitor thousands of points with a single 150 micron fiber.

Claims 10-12 have been added and are directed to an apparatus having the above-noted distinctions and are, therefore, believed to be allowable.

Applicant respectfully requests reconsideration of all claims now pending in the application and submits that, in view of the amended claims (4 and 8) and arguments presented herein, the Examiner's rejection of the claims under 35 U.S.C. § 102, 103 and 112 have been overcome. The Examiner is respectfully requested to withdraw the rejections. It is submitted that the claims, as now presented, are proper for allowance, which allowance is respectfully requested.

It is believed that no additional fees are due at this time other than for the Petition to Revive enclosed herewith and for the additional independent claim which has been added herein. The Commissioner is hereby authorized to charge these fees, and any additional fees to Deposit Account No. 19-1800.

If the Examiner feels that a telephone conversation would assist in bringing this case to a conclusion, he is requested to contact the undersigned at 713-782-3620.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned: "MARKED-UP COPY SHOWING CHANGES MADE"

Respectfully submitted,
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Attachment

MARKED-UP COPY SHOWING CHANGES MADE

In the Specification

The paragraph at page 1, lines 2-7:

This invention relates to an improved process to measure and monitor conditions of electrical motor systems, particularly submersible motor systems, using a deployment of optic fibers, sensors, and [micomachines] micro-machines wound integrally with the electrical wire used in the construction of an electrical motor's stator or armature.

The paragraph at page 3, lines 7-18:

The process of the invention comprises providing a motor system having at least one component selected from a stator and an armature, and at least one means for data measurement. Means for measuring data useful in the process of the invention include optic fibers, sensors, [micomachines] micro-machines, and combinations thereof. Data is collected from the data measurement means and transferred to a data collection station. When optic fibers are used, the fibers become both the means for measuring data and a means for transferring the data to the collection station. If the motor is subsurface or subsea, the data collection station could be at the surface or above the surface of the sea.

In the Claims

4. **(AMENDED)** A process according to claim 1 wherein said means for measuring data is selected from optic fibers, sensors, [micomachines] micro-machines, and combinations thereof.

8. **(AMENDED)** A process according to claim [1] 5 wherein said means for measuring data is selected from optic fibers, sensors, [micomachines] micro-machines, and combinations thereof.